Manuscript Report No. 86-13

Survey of the Moose Population of Game Hunting Area 16, in January 1982.

By Knudsen, Brian, 1986

Manitoba
Natural Resources
Wildlife
Biological Services

87-00088/

NOT FOR PUBLICATION

This manuscript report is for your information only, with the understanding that its contents are not for general distribution or publication. Many of the reports in this series are in the nature of progress reports which will eventually be assembled into final reports for publication, or will be subject to additional analysis. The information herein is the property of the Wildlife Branch. The author reserves priority for publication. Citations should be by permission only, and should be referred to as personal communications.

Prepared by:

Approved by:

Merlin W. Shoesmith

Supervisor

Director

86-13

Knudsen, Brian. 1986.

A Survey of the Moose Population of Game Hunting Area 16 in January 1982.

Department of Natural Resources,
Wildlife Branch MS Report No. 86-13, 8 pp.

ABSTRACT

An aerial census of moose was flown in GHA 16 in January, 1982. A modified strip transect method was used, with two independent observers. Moose were so rare in this area that conventional parametric estimators could not be used. The data were analysed as if they were binomial. The probability of seeing a moose in each of the 1000 m X 400 m quadrats was 0.0023. The point estimate for the total moose population in the area was 26. The presence of coniferous vegetation and the extremely low frequency of occurrence of moose (judged to increase observer fatigue) suggested that this estimate might be biased toward underestimating the population. Any biases in estimation, however, are trivial relative to the difference between the estimated population and a population of 1200 to 1800 moose, which was the capacity of the area as judged by Canada Land Inventory in 1973.

submitted March, 1986
distributed July, 1986

TABLE OF CONTENTS

ABSTRACT..... i

TABLE OF CONTENTS.....ii

ACKNOWLEDGEMENTS.....iii

INTRODUCTION..... 1

METHODS..... 2

RESULTS..... 5

DISCUSSION..... 5

LITERATURE CITED.....8

ACKNOWLEDGEMENTS

Hank Hristienko, Tom Moran, Bob Cameron, and Vince Crichton flew the survey, prepared maps, and provided background information. Jim Johnson provided excellent aircraft and piloting. I thank all these people for their contributions.

INTRODUCTION

Game Hunting Area 16 (GHA 16) is an area of approximately 4600 sq km, located in central Manitoba, bounded on the west by highway 6, on the east by Lake Winnipeg, on the south by Lake St. Martin and the Dauphin River, and on the north by the Saskatchewan River.

Approximately 1/3 of the area was burned in 1961 and is now deciduous forest. The southeastern corner of the area is mixed coniferous-deciduous forest, with long north-south ridges interspersed with string bogs. The northern portions of the area are primarily mature coniferous forest.

GHA 16 was isolated from intensive pressure on its game populations until highway 6 was built to Grand Rapids in 1960. Before the building of the highway, few moose (Alces alces) were taken by licenced hunters each year, but the kill increased after the highway provided greater access to the area: in 1969 143 moose were harvested from the area by licenced hunters (B. Cameron pers. comm.) The increase in pressure on the GHA 16 moose herd was made more dramatic by the fact that in the 1960's snowmobiles were becoming common items of hunting equipment for winter moose hunters. The long string bogs in the northern Interlake were virtual highways for hunters on snowmobiles.

During the period of large harvests of moose by hunters in GHA 16 (1960 to 1971), the moose population there appeared to decline dramatically. The evidence for this decline was the difficulty in finding moose in GHA 16 during the Manitoba Wildlife Branch's annual aerial surveys of the age and sex structure of moose herds in late fall or early winter of each year. These surveys are not intended to produce estimates of abundance, but often provide indications of trends in local populations. For example, in the winter of 1973/74 only 23 moose could be found in the area, and in the winter of 1975/76, only 21 could be found. The survey described in this report was conducted in order to estimate the size of the GHA 16 moose herd in 1982.

METHODS

The survey method was systematic strip transects, each 400 m wide. All strips were aligned along an east-west axis. This alignment was chosen because of the convenient boundaries on the east and west sides: Lake Winnipeg and highway 6, respectively. The strips were drawn before flying on a standard 1:50,000 topographic map, which was used by the recorder during the flight. Another map, 1:250,000, was used by the pilot, who maintained a true east-west line by using the many topographic features appearing on the maps.

The aircraft used was a STOL-equipped Cessna 180. Both observers sat on the right side of the aircraft. Markers on the strut of the aircraft showed the observers the boundaries of the strip being searched. The aircraft flew at a height of approximately 250 m and at a speed of 100 - 150 km/h, depending on the direction and speed of the wind.

When an observer sighted a moose, he reported it to the recorder without signalling the other observer. The observers thus operated completely independently. The recorder noted the location of the moose on the map, and whether it was seen by the front observer only, the rear observer only, or both observers.

The GHA was initially divided into two strata. Stratum 1, expected to have higher densities of moose on the basis of flights in previous years, was the deciduous area burned in 1961. Stratum 2 was the remainder of the GHA. Initial plans called for a pilot survey to be flown in November to estimate the mean and variance of the density of moose in the two strata, and to calculate the optimal allocation of sampling effort. Lack of sufficient snow cover precluded a pilot flight, and consequently all flying took place on 28, 29, and 30 January, 1982.

Our intention was to use the double-count method of Magnusson et al. (1978) to compensate for observers' failing to see 100% of the moose falling within the transect strip. The mean number of moose per quadrat and the standard

deviation would be calculated from corrected data, followed by a stratified estimate of the total number of moose.

The original analysis procedure was not feasible because of an inordinately large number of quadrats which contained Ø moose (see RESULTS). This situation created a seriously non-normal distribution and created unreasonably crude estimates of the probabilities of observers' seeing moose, when applying the formulae of Magnusson et al. (op. cit.). We therefore rejected both conventional parametric analyses and the double-count approach, and treated the data as if they were binomial: that is, as if the only possible observations of moose per quadrat were Ø and 1. With this type of data, estimates of abundance, and their associated confidence intervals, can be generated by calculating the probability of seeing a moose in any one quadrat and proceeding with the parameters which describe means and standard deviations of binomial distributions (Snedecor and Cochrane 1967).

RESULTS

A total of 1302 km of transect were flown, comprising 520.8 sq km, or 11.3% of GHA 16. The total length of transect was broken into quadrats, 1 km long and 0.4 km wide. The number of moose in each quadrat was recorded. Three quadrats contained 1 moose and 1299 contained 0. The probability of seeing a moose in any single quadrat is therefore 3/1302, or 0.0023. The standard deviation of this probability is $\sqrt{(pq)/n}$ = 0.0013, where p = probability of seeing a moose (0.0023), q = 1 - p (0.9977), and n = sample size (1302). The 95% confidence interval (+/- 1.96 standard deviations) for the probability of seeing a moose in any quadrat is 0 to 0.0049. The total number of quadrats in the study area is 4600 / 0.4 = 11500. These data generate a point estimate of 26 moose in GHA 16, and a 95% confidence interval of 0 to 56.

DISCUSSION

The population estimate of 26 moose generated by this survey must necessarily be qualified in the light of unusually low densities of moose, a small sample size, immigration or emigration, and the vegetation of the area.

In any aerial survey, observers will fail to see some animals within the boundaries of sampling units. The number of animals missed will vary with fatigue of the observers,

lighting conditions, and the density of vegetation. In GHA 16, the extremely large number of empty quadrats could have fatigued the observers and may have caused some moose within the sampling units to pass undetected. In areas of coniferous cover, trees could have hidden moose from the observers. Both these considerations suggest a bias toward an underestimate of the population, but the possibility of a serious bias seems unlikely, because very few tracks were seen during the survey and only 6 moose were seen outside of sampling units. If many moose were being missed, one would expect that more tracks would have been seen inside and outside sampling units, and that more moose would have been seen during the extensive ferrying and turning time involved in every survey.

In most surveys, the effects of immigration and emigration can safely be assumed to be trivial, but in GHA 16, this is not the case. Movements of even a few moose into or out of the area would change substantially the estimates arrived at here.

In most aerial surveys of moose in Manitoba, the area observed ranges from 18% to 23% of the total area occupied by the population being estimated. In this survey the sample size was reduced to approximately 11% because very early in the survey it became apparent that the population was so low that the primary function of the survey was going to be to document a scarcity of moose, rather than to obtain

a precise estimate of the population. The consequences of this decision are the extremely wide 95% confidence intervals obtained above.

These qualifications lead one to be cautious in the use of the estimates generated by the data, and to focus on the undeniably precarious status of the moose herd in GHA 16. A safe interpretation would be to state that the moose population of GHA 16 in January, 1982, was fewer than 100 animals. This population size can be put into perspective by referring to the Canada Land Inventory classification of GHA 16, which is almost entirely Class 3 for moose. According to Goulden et al. (1973), this class will support 0.27 to 0.39 moose/sq km, or approximately 1200 to 1800 moose for all of GHA 16. Clearly, a population which is in the range of 5% to 8% of the carrying capacity of the habitat is in a critical situation.

LITERATURE CITED

Goulden, H.D., I.J. Milliken, E.J. Searle, and R.K. Schmidt. 1973. Canada Land Inventory. Land Capability Classification for Ungulate - Wildlife. A Manual Describing Its Application in Manitoba. Man. Dept. Mines, Res., and Environ. Manage., Winnipeg, Manitoba. 74 pp.

Magnusson, W.E., G.J. Caughley, and G.C. Grigg. 1978. A double-survey estimate of population size from incomplete counts. J. Wildl. Manage. 42:174-176.

Snedecor, G.W. and W.G. Cochrane. 1967. Statistical Methods (Sixth ed.). Iowa State Univ. Press. Ames, Iowa. 593 pp.